# TRANSPORTING LIVESTOCK OVERSEAS BY AIR

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

NOTE:

2 publications have this # - The other is entitled "Essentials for efficient dairy farming," published in Aug., 1957.

## PREFACE

Since the coming of the jet age in the early 1960's, the Transportation and Facilities Research Division (T&FRD) and the Animal Health Division (ANH) of the Agricultural Research Service have received many requests for information concerning the procedures and regulations for shipping livestock overseas by jet cargo. This report is an attempt to compile general information under one cover to answer many of the typical questions asked by persons interested in exporting livestock by air.

The Import-Export Animal and Products Staff of the ANH Division has the responsibility for enforcing laws pertaining to the health and humane aspects of overseas livestock shipments. The Transportation Research Branch of the T&FRD conducts research to find more efficient methods and equipment for transporting agricultural commodities. When livestock is transported, humane factors, such as space and ventilation requirements, must be integrated into the design of equipment to be used and into the handling methods. For these reasons the T&FRD and ANH have worked together in an effort to develop satisfactory equipment and procedures for shipping livestock by air.

The authors hereby acknowledge the assistance received from: Claude Smith, Chief of the Import-Export Staff of the ANH, in developing experimental shipping containers; personnel in the Foreign Agricultural Service's Livestock and Meat Products Division; and personnel in the Virginia Department of Agriculture. We acknowledge also the Alitalia Airlines Co., Reynolds Aluminum Co., and Trans World Airlines for their assistance in conducting test shipments of livestock and for defraying costs of some of the experimental containers.

## CONTENTS

# TRANSPORTING LIVESTOCK OVERSEAS BY AIR

By B. Hunt Ashby, agricultural marketing specialist,
Transportation and Facilities Research Division,
and John R. Langridge, chief staff veterinarian,
Import-Export Staff, Animal Health Division,
Agricultural Research Service

## SUMMARY

Increasing demands for meat and dairy products throughout the world have created a demand for high quality breeding animals from the United States. Coupled with the increasing demands are prices that are generally favorable to livestock exporters.

American farmers have not exported large quantities of livestock in the past and the machinery and marketing skills needed for smooth livestock export operations need to be developed. To be better able to respond to changing market conditions and to reduce the stress to the livestock in transit, exporters are resorting to airplanes to transport their animals.

Researchers in the T&FRD and ANH have attempted to aid exporters interested in shipping livestock by air by (1) giving some background and explanation of the special requirements and the costs of overseas shipping with which a shipper may be confronted, (2) outlining suggested procedures to follow when planning overseas shipments, and (3) developing and testing livestock pallet containers that can be handled in an aircargo system and at the same time protect the health and safety of the animals.

Four types of containers were tested under actual flight conditions and proved to be acceptable for transporting various types of livestock by air. These were: (1) A plywood pallet pen, designed and developed by ARS researchers, for cattle, sheep, swine, and ponies; (2) a commercially developed aluminum pallet crate for swine, calves, and sheep; (3) a commercially developed wirebound wood crate for veal calves; and (4) a traditional wood dowel turkey crate for feeder pigs.

## INTRODUCTION

During 1963 and 1964, a shortage of meat production in European countries caused a sharp rise in veal and beef prices. This situation created a demand for imported meat and for breeding animals to replenish supply and to rebuild herds.1/ In addition, the demand for both beef- and dairy-breeding animals in

1/ Robertson, J. K., Hoke, K. E., and Ashby, B. H. Transporting Fresh Beef to European Markets, U.S. Dept. Agr., Agr. Res. Serv., ARS 52-3, 15 pp. 1965.

Japan, South America, and the developing nations of Africa has increased in recent years. Coupled with these increasing demands are prices that are generally favorable to U.S. exporters. Some foreign governments are subsidizing the purchase of American breeding stock for their farmers. During calendar year 1968, the United States exported more than 13 million pounds of livestock and poultry valued at $41,064,813.2/ Nearly 8 million pounds of this was shipped by air.

Although the rates for air transport are relatively high when compared with the rates for surface-type transport, air transport offers some strong advantages for shipping livestock long distances. The speed of jet cargo service allows an exporter to respond quickly to changes in overseas markets while they are favorable and does not subject the animals to the stress of a long sea voyage. To illustrate--in 1969 a load of cattle was shipped by air from the United States to Chile in only 15 hours. By surface, the same shipment would have required about 18 days.

Speed and capacity have enabled jet cargo planes to operate at lower costs which, in turn, have brought about reduced air transport rates for many commodities, including some types of livestock. More rate reductions may be possible as more supercargo planes come into service in the early 1970's and as larger volumes of traffic evolve.

To be able to market his livestock overseas efficiently, an exporter needs certain information regarding costs, shipping requirements, and regulations. This publication (1) points out specialized airfreight handling requirements and costs, (2) outlines the general steps for exporting livestock by air, and (3) gives information about several types of pallet pens and crates that are acceptable for airfreight shipment of livestock.

## SPECIALIZED REQUIREMENTS ASSOCIATED WITH SHIPPING LIVESTOCK BY AIR

In general, the specialized handling requirements for shipping livestock by air are such that it is difficult for regular aircargo carriers to offer rates that would induce increased volume of livestock shipments. The specialized handling of animals for air shipping involves the need for a relatively large amount of space for each pound shipped. Other requirements are controlled temperature, humidity, and ventilation; special pens, crates, or containers; disposition of body wastes; and sometimes the extra care of feeding and watering the animals. Besides these requirements, special precautions must be taken to avoid any possible damage to the plane by an animal breaking loose or from animal excretions.

---

2/ Bureau of the Census. U.S. Exports, Schedule B. Commodity Groupings, World Area, Country, and Method of Transportation. U.S. Dept. Com., FT 450, 1968 Annual.

## Requirements for Handling the Animals

Jet freighters are designed primarily for palletized cargo, so the livestock cargo should be penned or crated in containers that can be handled easily on pallets and that will hold up during loading and unloading operations. However, on several occasions jet freighters have been chartered to transport loads of cattle that were not handled on pallets. For such shipments, special pens and protective floor covering were installed in the planes. Most of the procedures and regulations discussed in this report apply whether the animals are handled in pallet containers or not.

The weight of the pallet crates may be included in the transportation charges so the crates or containers should be constructed of fairly light materials but they should be strong enough to restrain the livestock and to withstand handling during loading and unloading and during takeoff and landing. Provisions must be made to keep all animal wastes within the container.

In addition to having strong construction, livestock pallet containers should be designed for the humane transportation of the animals. Interior surfaces must be free of any obstructions that could bruise or cut the animals. Floors should be gridded or covered with a material that helps maintain footing and prevents slippage. Adequate space and standing room should be provided for each animal. Table 2, in the appendix, has proved useful as a general guideline for determining the amount of container or pen space needed for each animal. However, this guideline is based on weight and may not apply to some of the many possible animal shapes and pen layouts.

Adequate ventilation is very important. Pallet containers must have enough openings so that sufficient ventilation from the plane's ventilation systems can get inside the containers. The ventilation problem is most critical when the crated animals are waiting to be loaded at terminals or when they are inside a grounded plane during hot weather. Crated animals should not be set in direct sunshine at air terminals. If the animals are required to wait for long periods in extreme heat, fans must be used to force ventilation inside the crates. Planes loaded with livestock should not remain on the ground any longer than necessary when stopping to refuel, or for other purposes, in warm climates, because air-conditioning systems in jet planes generally are not powerful enough to supply adequate cooling and ventilation at ground level.

If pallet crates are to be reused, they should be built of materials that can withstand cleaning with steam or strong chemical compounds. They should also be easy to disassemble for backhaul to the United States.

Highly specialized equipment and crews are required to load and unload the large jet cargo planes used for overseas shipping. Consequently, cargo flights usually originate from a few large airports that can handle large volumes of cargo and support the upkeep of the special crews and equipment. Unless special arrangements are made, U.S. livestock can be shipped only from airports that ANH has designated as ports of export. For this reason, livestock may have to be trucked a long distance from the farm to an approved port of embarkation, thus

adding substantially to shipping costs. Livestock exporters should consult the ANH Division to determine which airports qualify as embarkation ports.

If the animals are to be in transit for a prolonged period, feed and water for them must be provided. Generally, animals should not go without feed or water for more than 36 hours.

Because of the many and varied conditions that need consideration, only guidelines can be written concerning many of the humane factors. The veterinarian at the port of embarkation ultimately decides if the animals are being handled humanely and under sanitary conditions.

### Special Documentation Required

Special documents or origin health certificates are needed for export livestock shipments to show that the animals have been properly inspected and are healthy and free from evidence of communicable diseases. The health certificates are issued by veterinarians who have been accredited by USDA's ANH Division, State-employed veterinarians, or Federal veterinarians. Such certificates must be endorsed by ANH's veterinarian-in-charge (or a Federal veterinarian acting for him) in the State of origin. The endorsed certificate must then accompany the livestock to the port of export. Requirements for health certification of export livestock will vary according to the regulations of designated country of import and are subject to frequent change. The import requirements are usually contained in the import permit that the consignee or importer in the foreign country must obtain from animal health officials in his country. In addition, export livestock must meet the minimum export health requirements of USDA's ANH Division. These health requirements are designed to promote export trade in U.S. livestock by insuring that only healthy animals are shipped to foreign countries and that they are handled humanely.

## INTERNATIONAL AIRLINE RATE STRUCTURE

A full description of all the intricacies of international airline shipping rates would be quite involved and beyond the scope of this report. However, the following facts about rate structure are offered to the potential shipper as a general background. Most international rates are determined by unanimous agreement among the carrier members of the International Air Transport Association (IATA). Such rate agreements are then filed with the various governments for their approval and with the U.S. Civil Aeronautics Board (CAB). Under applicable law and CAB policy, rate agreements that affect U.S. air transportation must be approved by the CAB before the agreements become effective. Shippers and others are free at any time to petition the CAB to modify, or terminate approval of, any IATA agreement.3/

---

3/ U.S. Civil Aeronautics Board. An Introduction to Air Freight Rates (September-November 1966).

Three types of aircargo rates that are of interest to the livestock shipper are: (1) Specific commodity, (2) general commodity, and (3) charter. For less than planeload shipments, the specific commodity rates are the least costly. However, in instances where specific commodity rates are not in effect, general commodity rates apply. For example, a recent aircargo tariff quoted specific commodity rates for veal calves, ponies, and pigs at 38 cents, 38 cents, and 39 cents per pound, respectively, for 2,200 pounds minimum between New York City and Barcelona, Spain. However, specific commodity rates are not listed in the tariff for other types of livestock between these points, so the general cargo rate of 127 cents per pound will apply to animals such as cattle and horses. Of course, if a full planeload or more of livestock is involved, the shipper should investigate charter rates, which usually are the least costly of all the rates.

A carrier member may, by application, propose revisions (subject to IATA and governmental approval) to the existing specific commodity rate structure. Carriers have initiated some of the existing specific commodity rates for livestock after sizeable movement developed between two points or after sufficient indication that a greater volume of traffic would evolve if rates were lower.

## SUGGESTED PROCEDURES FOR EXPORTING LIVESTOCK BY AIR

Procedures for marketing livestock overseas are quite variable and depend upon such factors as the country of destination, type of animal, and mode of transportation. The beginning exporter may have difficulty determining the exact procedure to follow because no easy step-by-step procedure can be set forth. However, the following general steps are recommended:

1. Check minimum U.S. export and import requirements of the country of destination with USDA's ANH Division.--In some cases, existing regulations, either domestic or foreign, may bar the export or import of a particular type of livestock to a particular country. For example, because of foot-and-mouth disease, the United States cannot import domestic cloven-footed animals from Great Britain. On the other hand, because of the incidence of blue-tongue in sheep, the United States cannot export sheep to Great Britain.

Specific information on animal health requirements for export should be obtained from ANH's veterinarian-in-charge in the State of origin or from the Import-Export Staff, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, Federal Center Building, Hyattsville, Md. 20782. Such personnel will provide information on the health certifications and humane requirements that pertain to export animals and on the airports that qualify as ports of export.

2. Check with the USDA's Foreign Agricultural Service (FAS) for marketing information.--In nearly every country, FAS agricultural attachés gather marketing information and promote the sale of U.S. products abroad. In addition, the FAS staff of livestock marketing specialists in the Washington, D.C., office can supply helpful marketing information and help bring foreign buyers and

American sellers together. More specific information may be obtained by contacting the Livestock and Meat Products Division, FAS, U.S. Department of Agriculture, Washington, D.C. 20250.

3. Check with agents of potential airline carriers for information on rates and services to the intended destination.--An agent for a carrier that serves the country of destination can furnish information to the shipper about the kinds of services offered, any special criteria required (such as special crating and handling procedures), and ports of embarkation and debarkation. If a large number of animals is to be shipped, the shipper may want to inquire about chartered flights, which usually can be obtained at lower rates.

4. Check the required documentation.--Fees are charged for some documents. Properly completed documents will help the shipper avoid costly delays. Shipping agents who specialize in international trade can be hired to handle the details of documentation. Airline and ANH Division personnel can be consulted for advice on documentation.

Although documentation requirements change frequently and without advance notice, the following documents are usually required when livestock is exported.4/ 5/

(a) U.S. Export Declaration--Commerce Form 7525-U.--This form is required by the U.S. Government for any commercial shipment leaving the United States.

(b) Commercial invoice.--This document is a record of transaction between the buyer and seller and must accompany the shipment. It must give all details of identification about the animals, including brands, birth dates, approximate weights, country of origin, description of crating, value, and gross and net amounts due.

(c) Import permit.--The buyer must secure this document from his government. Some countries require that it accompany the shipment.

(d) Insurance certificate.

(e) Origin health certificate.--This certificate lists the animal's individual identification number, breed, sex, age, and a history of veterinary inspection at origin and all tests and vaccinations

---

4/ International Aircargo Tariff, issued jointly by: Alitalia Airlines, B.O.A.C., Flying Tiger Line, Iberia, Japan Airlines, LAN, Lufthansa, and Swissair. February 1969.

5/ International Marketing Handbook for Santa Gertrudis Producers, San Gertrudis Breeders International, Kingsville, Tex. 78363

for the animal. The certificate must be endorsed by an authorized ANH Division veterinarian in the State of origin.

(f) Certificate of Inspection of Export Animals, USDA, ANH Form 17-37 (Mar. 1967).--This document is completed after the animals have been loaded at the U.S. port of export. It certifies that the animals have been correctly identified, have passed the health requirements for shipment, and that they have been loaded for shipment under humane conditions.

Other documents sometimes required are:

(a) Pro forma invoice.--This invoice is similar to the commercial invoice, but is somewhat more involved. It is developed by the seller and sent to the buyer and gives full information on the price and delivery cost of the animals. Some countries require certification of the document by the Chamber of Commerce, and some countries require this document to be legalized by their consul.

(b) Certificate of origin.--This document is for shipments to countries which, by treaty, have special duty assessments on imports from the United States.

5. Check total shipping and related costs.--Since some costs for exporting livestock are not readily apparent, a potential exporter of livestock should get an estimate of shipping and related costs. So, to get a better accounting of true expenses, it is suggested that he total the costs of the following, where applicable:

(1) Vaccination and health certification fees.

(2) Transportation for the animals to an airport that is qualified to handle international cargo shipments.

(3) Purchasing or renting shipping containers.

(4) Air freight rates (be sure to include weight of crates as well as weight of the animals).

(5) Insurance fees.

(6) Other documentation fees.

(7) Import levies and taxes.

(8) Shipping agent fees. (If the services of a shipping agent are used, some of the above expenses may be included in his charges.)

## PALLET CONTAINERS

### Basic Criteria for Pallet Pens and Crates

The primary consideration concerning any pens or crates used to transport livestock is that they protect the health and allow humane handling of the animals riding in them. To assure proper care of the animals, a certain amount of space, depending on the size of the animal and the time in transit, must be provided. Interior surfaces of the containers should be free of protruding objects such as bolts and nails that can cut or bruise. In addition, ample ventilation from the aircraft's air conditioning systems to the animals inside each container must be provided.

Aircargo carriers require that pallet containers be strong enough to restrain the livestock and to contain their waste products. An animal that breaks out of a crate may damage other valuable cargo or injure airline personnel. Also, some planes are used for passenger service during the day and converted to cargo service during the night. If animal waste leaks out of the pallet container, it might corrode expensive parts of the plane and leave offensive odors. In addition, the chemicals that would be necessary for cleaning and disinfecting a contaminated plane might damage parts of the plane. Therefore, the pallet container should be strong, and the floor and lower walls should be leakproof.

Jet cargo planes are designed to carry cargo consolidated in pallet units or in modules that make up a pallet size unit. Livestock should be shipped in a container or containers that will fit on a basic jet aircraft pallet and that will conform to the particular aircraft used. The combined shape and size of the required basic pallet and the required container shape usually are referred to as the contour. Contours vary according to aircraft type, pallet size, and number of containers on the pallet. As many as 16 approved contours are shown in the IATA Bulk Unitization Manual, which was issued in October 1969. Figure 1 illustrates two typical contours.

A basic pallet is loaded and unloaded with specialized cargo handling equipment. Generally, all cargo or containers loaded in the main compartment of a jet aircraft must first be loaded on and strapped to a basic pallet with restraining nets. The two basic pallet sizes used in the present jet cargo handling systems are 88 by 125 inches and 88 by 108 inches. At least 2 inches of clearance must be left between the perimeter of the basic pallet and the sides of the pallet container for room to fasten the restraining nets.

Even though pallet containers or crates that are used for transporting livestock by air should be strong, they should also be as light in weight as possible because container weight usually is included in the shipping charges. If the containers are to be reused, they must be able to withstand chemical or steam cleansing, and they should be demountable for backhaul.

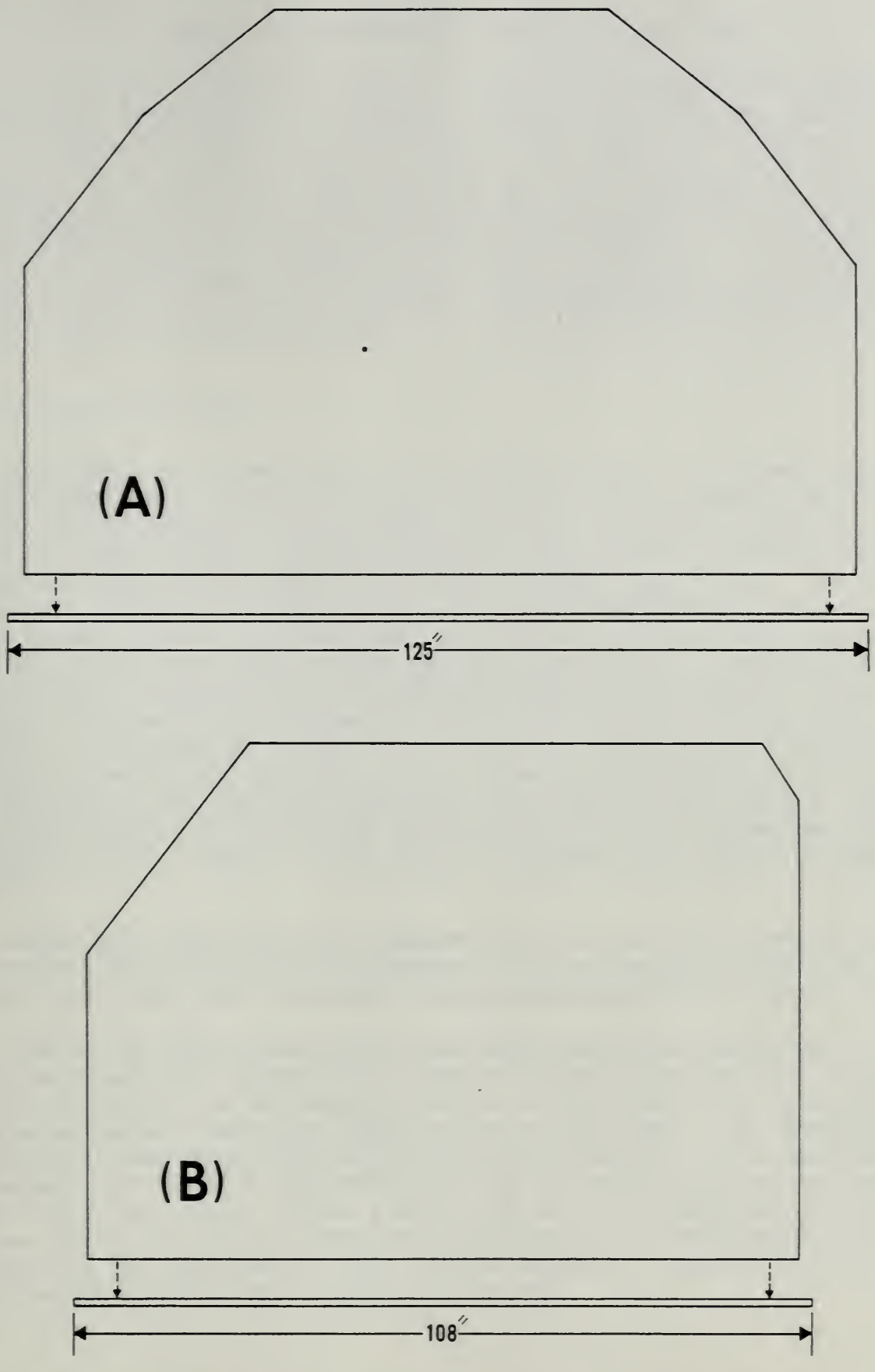


Figure 1.--End views of two typical jet aircraft contours with (A), An 88- by 125-inch basic pallet and (B) with an 88- by 108-inch basic pallet.

## Examples of Acceptable Pallet Pens and Crates

The shipper usually is required to furnish an acceptable container for shipping the livestock by air freight. Pallet pens or crates may be purchased from a commercial source or constructed by the shipper as long as the containers meet the specifications required by both the carrier and the ANH Division. Do-it-yourself containers may not meet requirements and may cause the shipment to be detained at the port of embarkation. For this reason, many carriers will suggest a commercial supplier of livestock pallet containers, usually one with whom they have had previous experience. Discussed below are examples of various types of containers that are acceptable for transporting certain types of livestock by air.

### USDA Plywood Pallet Pen

The T&FRD, in cooperation with the ANH Division, developed a plywood pallet pen that can be used to transport several types of animals by jetplanes. The pen can be modified to fit either the 88- by 125-inch or 88- by 108-inch basic jet cargo pallet. Design features allow the four sides and floor of the pen to be constructed easily with boards, plywood, and nails. The component parts are shipped to an airport where they are assembled on the basic pallets. Steel strapping and bolts are used to hold the assembled pallet pen together. To hold animal wastes and bedding inside the container, a large sheet of heavy plastic film is placed between the plywood pen and the pallet. After the animals are loaded, the overlapping edges of the plastic are folded upward and stapled to the sides of the pen. Nylon cargo webbing is used to secure the pen to the basic cargo pallet. Once secured to the pallet, the livestock pen can be handled with the same equipment and speed as other cargo. Figure 2 shows the sequence of setting up and loading the USDA plywood pallet pen in a jet cargo plane. Figure 3 shows a plywood pallet pen modified to transport swine.

After use, the pen may be disposed of or it may be dismantled and cleaned for reuse. If the pen is to be reused, it should be constructed of exterior grade plywood that will withstand cleaning and possible outside storage.

The use of the plywood pallet pen offers the added advantage of allowing less-than-planeload shipments of livestock without the need for chartering an entire aircraft. The two endgates may be moved inward to prevent tall animals from being wedged under the sloping walls of the plane. If necessary, partitions can be installed easily to separate the animals. To reduce container weight and cost of building materials, the pen height may be shortened for hogs, sheep, or calves. Table 1 shows estimates of the number of cattle of various sizes that may be loaded in a plywood pallet pen designed for the 88- by 125-inch jet cargo pallet pen. In the appendix, figure 7 shows detailed construction diagrams for this particular pen.

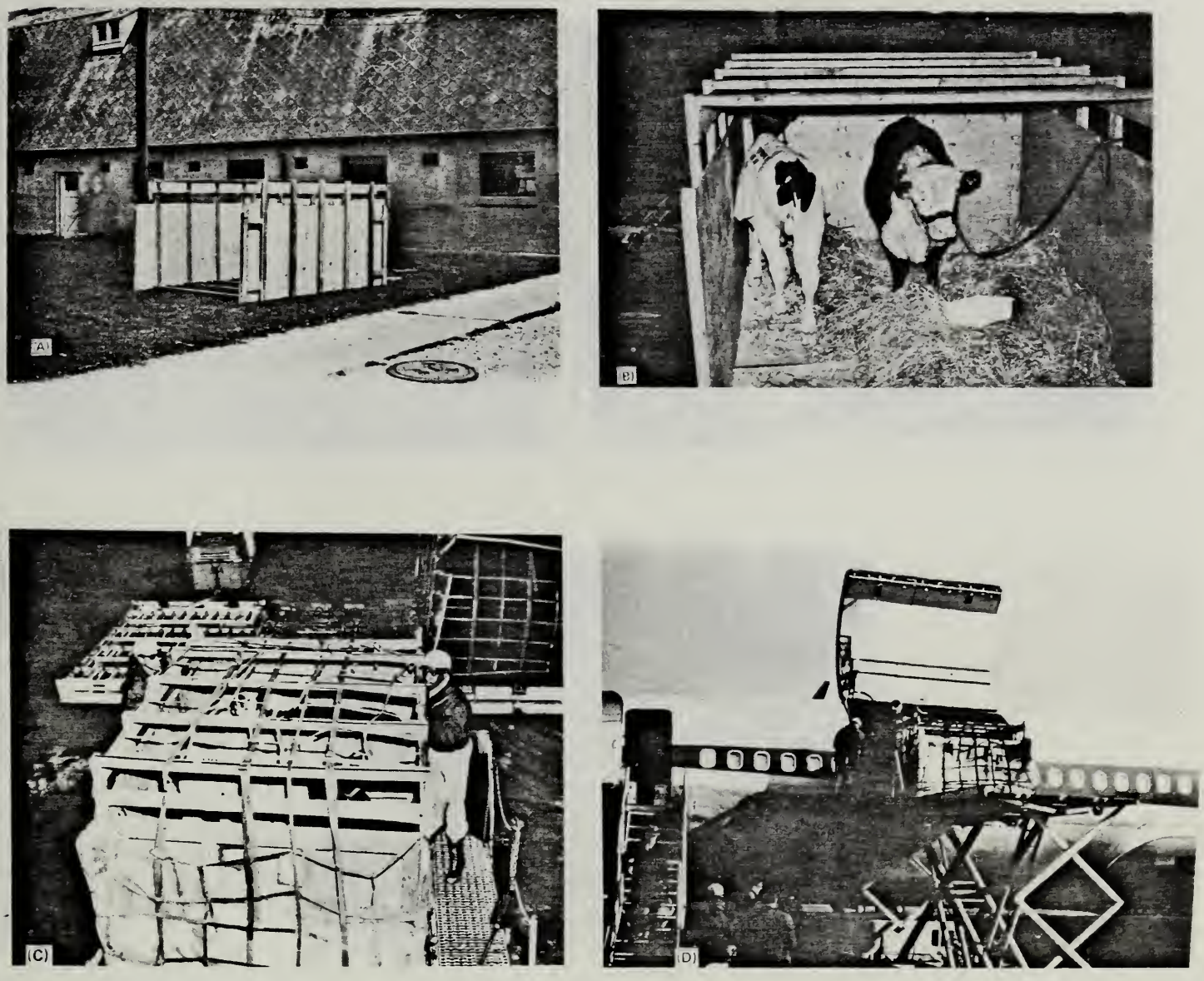

Figure 2.--(A), (B), (C), and (D) illustrate the sequence of setting up, handling, and loading a USDA plywood pallet pen in a cargo jetplane.

The USDA container is used only as an example in this report, and it is not meant to imply that this is the only type of plywood pallet pen suitable for air shipments. Similar types of plywood containers are available from commercial sources or may be built by individual shippers. However, care should be taken to make sure that the container will meet the requirements of the carrier, IATA, and the ANH Division before any construction is started.

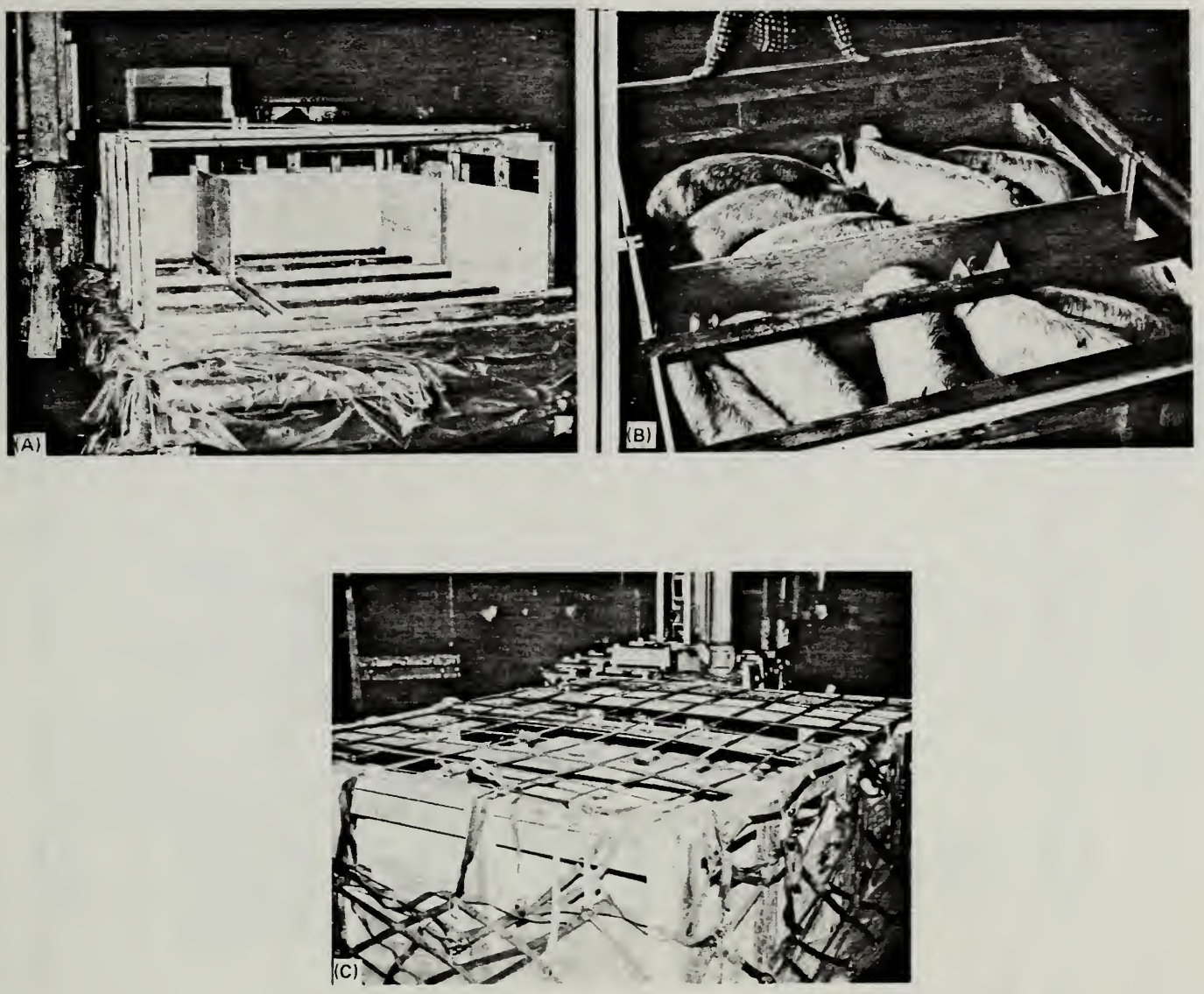


Figure 3.--The plywood pallet pen, modified for swine (A), being prepared for loading; (B), after loading; and (C), after strapping to the basic pallet.

TABLE 1.--Estimated cattle capacity of a USDA plywood pallet pen on a jet cargo pallet, 88 by 125 inches

| Animal weight 1/ | Estimated animal height | Pallet pen clearance height | Floor space required per animal 2/ | Floor space available in the pen | Number of animals per pallet pen | Total animal weight per pallet |
|---|---|---|---|---|---|---|
| | Inches | Inches | Sq. ft. | Sq. ft. | | Pounds |
| Group I | | | | | | |
| 1,050 | 53.5 | 60 | 14.04 | 51.5 | 3 | 3,150 |
| 1,000 | 53.0 | 60 | 13.56 | 51.5 | 4 | 4,000 |
| 950 | 53.0 | 60 | 12.96 | 51.5 | 4 | 3,800 |
| Group II | | | | | | |
| 900 | 50.4 | 53 | 12.42 | 59 | 4 | 3,600 |
| 850 | 50.4 | 53 | 12.00 | 59 | 5 | 4,250 |
| 800 | 50.4 | 53 | 11.40 | 59 | 5 | 4,000 |
| 750 | 49.5 | 53 | 10.74 | 59 | 5 | 3,750 |
| Group III | | | | | | |
| 700 | 44.5 | 46 | 10.14 | 64.0 | 6 | 4,200 |
| 650 | | 46 | 9.54 | 64.0 | 6 | 3,900 |
| 600 | | 46 | 9.00 | 64.0 | 7 | 4,200 |
| 550 | | 46 | 8.40 | 64.0 | 7 | 3,850 |
| 500 | | 46 | 7.86 | 64.0 | 8 | 4,000 |
| 450 | | 46 | 7.32 | 64.0 | 8 | 3,600 |
| 400 | | 46 | 6.78 | 64.0 | 9 | 3,600 |
| 350 | | 46 | 6.30 | 64.0 | 10 | 3,500 |
| 300 | | 46 | 5.76 | 64.0 | 11 | 3,300 |

1/ The animals are grouped according to clearance height of the pallet pen. As the height of the animal increases, the pen endgates must be moved inward to prevent the cattle from being wedged under the slope of the airplane wall.

2/ Requirements listed are based on the space guide for export livestock (see table 2 in the appendix).

Aluminum Pallet Crate

The double-deck aluminum pallet crate may be used to transport swine, veal calves, and sheep (see figure 4). This container is divided into four compartments--two on each deck, with a loading gate for each compartment. The aluminum crate is light in tare weight, is reusable, and may be dismantled for backhaul or storage. The main disadvantages are a high initial cost and the limited number available for customer use. Because of the relatively high cost of this type of container, the airlines or shipping agencies may purchase the containers and lease them to shippers.

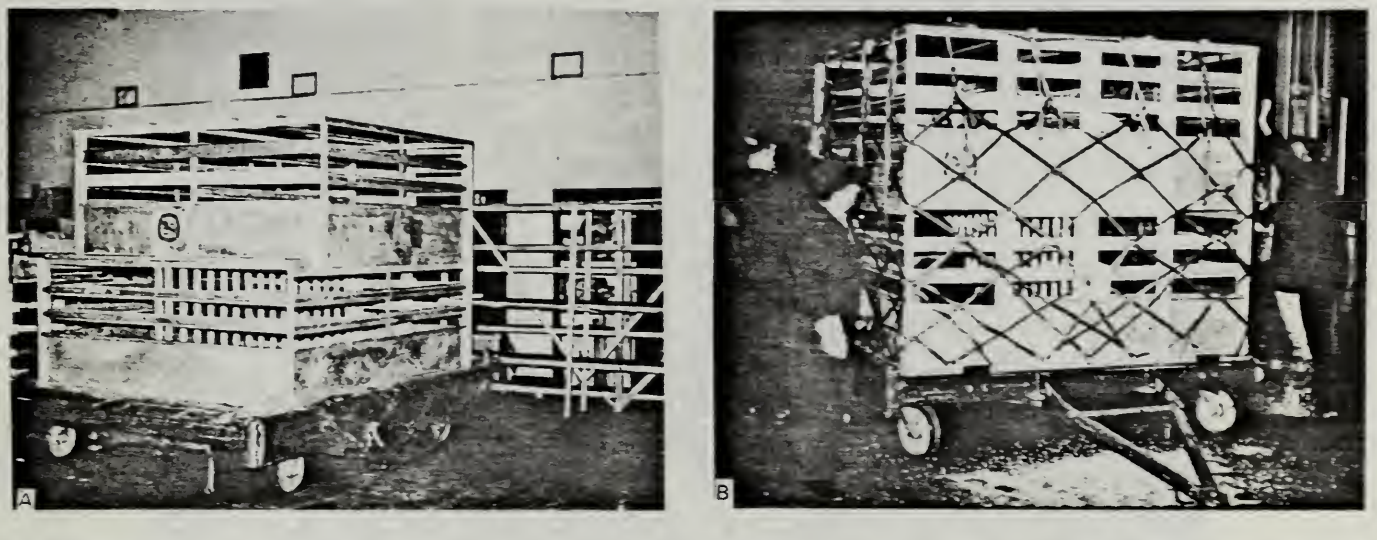


Figure 4.--An aluminum pallet crate designed for the 88- by 108-inch jet cargo pallet (A), before loading and (B), after loading with swine and strapping to the basic pallet.

Wirebound Wood Crate

The wirebound wood crate was developed and used successfully for the large number of veal calf shipments made to Italy during the mid-1960's. This container offers the advantages of low cost, light tare weight, and expendability. A major disadvantage of this type of crate is that it is limited to carrying calves and possibly sheep, because larger animals will break the slats and become entangled in the wire. Pigs will chew off the thin slats and free themselves from the container.

The 88- by 125-inch jet cargo pallet will hold 10 wirebound wood crates, 36 by 37 by 40 inches (figure 5). A container of these dimensions has been approved to transport three calves up to about 1 month of age.

Figure 5.--Wirebound crates of veal calves after loading in a jet cargo plane. (Photo, courtesy of TWA.)

Turkey Crate (wood dowel)

Turkey crates have been used successfully for air transport of feeder pigs. Personnel in the Virginia Department of Agriculture first suggested the use of turkey crates for this purpose, and USDA personnel conducted simulated transit tests. Pigs, loaded in wood dowel turkey crates, have been successfully shipped by air to several overseas countries.

The turkey crate is relatively low in cost, sturdy, and well ventilated. The crates may be stacked on the jet cargo pallets or in the belly cargo compartment of passenger planes (see fig. 6). The initial cost of the crate allows it to be an expendable item.

Figure 6.--Wood dowel turkey crates prepared for shipping feeder pigs by air freight.

Several types and sizes of turkey crates are available. However, only one size and type is recommended for shipping pigs overseas by air. The turkey crate should meet the following criteria:

1. Outside dimensions should be at least 24 by 24 by 36 inches.

2. Sides should be made of oak dowels, spaced no more than 1 1/2 inches apart, and the dowels must pass through a reinforcing strip at midheight.

3. Some means of retaining animal wastes in the container, without blocking ventilation, should be provided.

A turkey crate that meets the above qualifications can be used to transport the following numbers of pigs in the indicated weight range:

| No. of pigs per crate | Weight per pig |
|---|---|
| 3 | 45 lb. |
| 2 | 45-55 lb. |
| 1 | 55-75 lb. |

Airline companies require a splash shield to keep all animal wastes in the crate. One method of providing this splash shield on turkey crates is to set the crate over a double layer of plastic film and fold the film up the sides of the container and staple it at the midsection reinforcing strip. Care should be taken that the plastic film is not placed so high around the

container that it will cut off air circulation to the animals in the crate. In addition, at least 1 inch of either ground corncobs, sawdust, or wood shavings should be placed in the crate for bedding and moisture absorption.

## Pallet Pen Construction Diagrams

The dimensions in figure 7 conform only to igloo contour No. 1 in the IATA Bulk Unitization Manual issued in October 1969. This contour allows the largest volume of all of the IATA contours, but it will fit only certain types of jet aircraft. Because of the variability in contours that will be necessary for different types of aircraft, potential shippers should contact their carrier for detailed information concerning types of aircraft that will be used and contour dimensions before constructing any pallet pens.

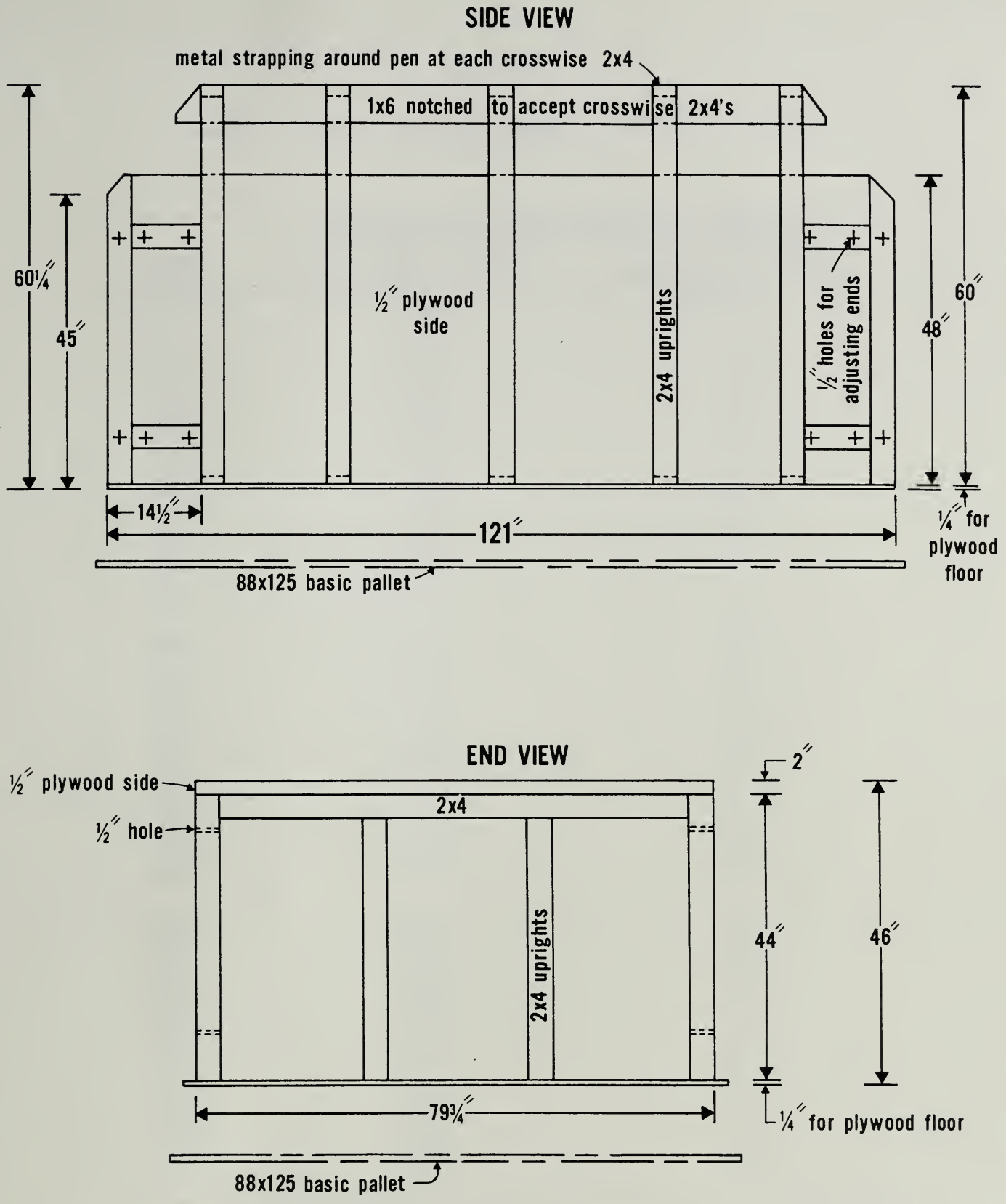


Figure 7.--Construction diagrams for the USDA plywood pallet pen with side-view detail and end-view details.